

Comparing 2019 Census Test and 2020 Census Self-Response Rates to Estimate Decennial Environment

A New Design for the 21st Century

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Executive Summary

Study Overview

The 2020 Census was accompanied by a diverse array of national- and state-level paid advertisements, partnership outreach programs, news coverage, and more designed to increase knowledge about the census and motivate households to self-respond, specifically through the internet mode. The effect of these programs—collectively referred to as the decennial environment—was estimated by comparing self-response rates (SRRs) between the 2020 Census and the 2019 Census Test, which was void of advertisements. Additionally, sampled housing units in the 2019 Census Test were spread across the country, so word of mouth was limited.

The 2019 Census Test took place from June 13 to August 15, 2019, which created a 64-day window to self-respond. The 2019 Census Test did not include the Nonresponse Followup operation (NRFU), but the data collection period was commensurate to the 2020 pre-NRFU self-response period. The 2019 Census Test was designed to study the impact of including a citizenship question in the census. A sample of 480,000 addresses were included in the 2019 Census Test. Of these, 240,000 addresses that were not asked the citizenship question were eligible for this analysis for comparability to the 2020 Census, which did not include a citizenship question.

To understand if participating in the 2019 Census Test affected the likelihood of responding to the 2020 Census, a post-hoc sample was drawn from the unused portion of the American Community Survey (ACS) 2019 sample universe, and followed the same sampling procedures as the 2019 Census Test: housing units in the Type of Enumeration Area 1 areas were systematically sampled (group quarters and housing units in Puerto Rico, Remote Alaska, and the 2019 Census Test sample were excluded) to select a group of 240,000 housing units (see Poehler, 2019, for a more complete description of the sampling procedure). These housing units' 2020 self-response data formed a post-hoc comparison sample to the 2019 Census Test sample in 2020 housing units' self-response data. The self-response rates of the post-hoc sample (overall and by mode) were calculated and compared to the self-response rates of the 2019 Census Test sample.

This analysis compares how the 2019 Census Test sample households changed response modes between 2019 and 2020. Additionally, comparisons were made to the post-hoc sample. Self-responses received during a comparative 64-day window were included in the analysis. For the 2020 Census, this includes self-responses received from the start of the Internet Self-Response (ISR) operation on March 12 through May 14, 2020. Through comparisons, we then determined if a significant percentage of households by mode did not respond in 2019, but responded in 2020, and whether respondents that used mail or Census Questionnaire Assistance (CQA) in 2019 switched to internet in 2020.

Audience segmentation data were used to subset the 2019 Census Test and 2020 Census data. SRRs overall, and separately for each response mode, by audience segmentation were compared.

To encourage self-response, two mail contact strategies were used in both the 2019 Census Test and the 2020 Census: Internet First and Internet Choice. The Internet First contact strategy emphasized online response as the primary self-response option, whereas the Internet Choice contact strategy was used in areas with low internet connectivity or areas with characteristics that made it less likely the recipients would complete the census questionnaire online. The 2019 Census Test households were matched to the 2020 Census data where the contact strategy was the same to ensure that a difference in contact strategy did not influence the response pattern. The 2020 Census mailing cohorts were updated based on the Census Program for Evaluations and Experiments alternate mailings. The 2019 Census Test households were then grouped by their updated 2020 mailing cohort assignment. SRRs overall, and separately for each response mode, by mailing cohort were compared.

Results and Conclusions

There were 240,000 households in the 2019 Census Test that were assigned to the treatment condition. These households matched to 235,000 households in the 2020 Census. The post-hoc sample contained 240,000 households, which matched to 235,000 households in the 2020 Census sample. Excluded units include, but are not limited to, those that were not valid for the final collection universe or the enumeration operations and cases that were determined to be transitory locations.

The 2019 Census Test SRR was 51.7 percent, while the SRR for the 2019 sample in 2020 was 60.0 percent. The overall SRRs were significantly different by an average of 8.3 percentage points. The post-hoc overall SRR of 62.9 percent was significantly different by an average of 2.9 percentage points compared to the 2019 sample in 2020. Confusion over the multiple tests may have caused the difference.

The decennial environment also changed how people responded. There was a significant difference of 14.0 percentage points in the internet self-response mode for households in both the 2019 Census Test and the 2020 Census. Therefore, we have sufficient evidence to conclude that the decennial environment encouraged more people to respond online.

There was significant evidence that the decennial environment may have caused a difference in the overall SRR in each audience segment between 2019 and 2020. There was a significant difference in the proportion of internet response in 2020 compared to 2019 for each audience segment. The highest self-response rate was within the responsive suburbia segment for both time periods.

There was a significant difference in the overall SRR in all mailing cohorts. Because the 2019 Census Test and 2020 Census used the same contact strategies, the decennial environment may

have caused the increase in Internet First mailing cohort's overall SRRs, which encourages people to respond online. There was a significant difference in the proportion of internet response in 2020 compared to 2019 for each mailing cohort, indicating that the decennial environment encouraged people to respond online.

Recommendations

The recommendations listed below are in order of priority.

1. **Continue the advertising campaign strategies used to promote online self-response in the 2020 Census for the 2030 Census.** The goal of the advertising campaigns of the 2020 Census was to encourage households to self-respond, specifically through the internet response mode. Research has shown that outreach strategies encouraged self-response, specifically online self-response, to the 2020 census.
2. **Do not conduct a test for at least year before the 2030 Census.** The post-hoc sample SRR of 62.9 percent was significantly different from the 2019 Census Test sample's SRR in 2020 of 60.0 percent, potentially because of thinking they had already responded.

1. Introduction

The 2020 Census was accompanied by a diverse array of national- and state-level paid advertisements, partnership outreach programs, news coverage, and more designed to increase knowledge about the census and motivate households to self-respond, specifically through the internet mode. The effect of these programs—collectively referred to as the decennial environment—was estimated by comparing self-response rates (SRRs) between the 2020 Census and the 2019 Census Test, which was void of advertisements. By matching 2019 Census Test data to 2020 Census data, we compared self-response behavior with and without the decennial environment.

2. Background

The 2019 Census Test was carried out in the summer of 2019 to measure the effect of including a citizenship question on self-response. The test included a control condition with the citizenship question included on the form and a treatment condition with the citizenship question removed from the census questionnaire (Poehler, Barth, & Oliver, 2019).

The 2019 Census Test did not include a messaging campaign or other media that would be expected of a 2020 Census communications campaign (e.g., no paid advertising, partnership outreach, public events, etc.). Additionally, sampled housing units were spread across the country, so word of mouth was limited. The 2019 Census Test did not include the Nonresponse Followup operation (NRFU), but the data collection period was commensurate to the 2020 pre-NRFU self-response period. For the 2019 Census Test, households were stratified into high, medium, and low strata on the percentage of noncitizens and the Low Response Score for each tract (see Poehler, 2019, for more details on how the sample was constructed). Housing unit addresses were systematically sampled within each stratum after being sorted geographically and assigned to a treatment or control group. Eighty thousand addresses were sampled for each stratum and treatment, creating a total sample of 480,000 addresses.

As part of the 2020 Census communications campaign planning, the U.S. Census Bureau and Team Y&R, the communications contractor, developed a classification scheme that grouped census tracts into eight different segments (Kulzick et al., 2019). These segments reflected shared demographic characteristics and similar patterns of self-response behavior and were designed to help media planners tailor advertisements to different regions of the country. Audience segments were assigned to each household in the 2019 Census Test. These segments were matched to their 2020 Census data by Master Address File Identifier (MAFID); this allowed for the efficacy of the decennial environment to be evaluated separately for each audience segment.

To encourage self-response, two mail contact strategies were used in both the 2019 Census Test and the 2020 Census: Internet First and Internet Choice. The Internet First contact strategy emphasized online response as the primary self-response option, whereas the Internet Choice

contact strategy was used in areas with low internet connectivity or areas with characteristics that made it less likely the recipients would complete the census questionnaire online.

In 2020, households began to receive census mailings on one of five different dates depending on their cohort assignment. These mailing cohorts were designed to balance the workload for Census Questionnaire Assistance (CQA) call centers and mail carriers. Because of the mail delivery schedule differences, later cohorts likely had more exposure to 2020 Census advertising materials before receiving mailed materials. The households included in the 2019 Census Test were matched to 2020 mailing cohorts and contact strategies, which allowed for the effect of the decennial environment to be evaluated separately for each contact strategy and cohort.

3. Methodology

Households assigned to the treatment condition in the 2019 Census Test (i.e., those not asked the citizenship question) were matched to their 2020 Census data by MAFID.¹ We used the Decennial Response File (DRF) 1 housing unit files for the 2020 Census data, and the 2019 Census Test housing unit level analysis file for the 2019 Census Test data. In addition to these files, the tier 1 Sample Delivery File (SDF) was used to determine the mailing cohorts and the tier 2 collection events file was used to determine the date when paper questionnaires were checked in.

There could be several responses for a single household in the 2020 Census DRF1 dataset. Unduplicated, sufficient responses received within the specified timeframe were used in this analysis. The 2019 Census Test analysis file was already unduplicated and had a flag for sufficiency.

To understand if participating in the 2019 Census Test affected the likelihood of responding to the 2020 Census, a post-hoc sample was drawn from the unused portion of the American Community Survey (ACS) 2019 sample universe, and followed the same sampling procedures as the 2019 Census Test: housing units in the Type of Enumeration Area 1 areas were systematically sampled (group quarters and housing units in Puerto Rico, Remote Alaska, and the 2019 Census Test sample were excluded) to select a group of 240,000 housing units (see Poehler, 2019, for a more complete description of the sampling procedure). These housing units' 2020 self-response data formed a post-hoc comparison sample to the 2019 Census Test sample. A unique response was selected using the same methodology as above.

Data for the 2019 Census Test and the 2019 sample in the 2020 Census were weighted using the 2019 Census Test's base weights. Replicate weights were used to estimate variance, which was used to calculate the standard errors. Data for the post-hoc sample were weighted using the

¹ The unit of analysis for this evaluation was address rather than occupant. Some addresses were likely to have changed occupants between 2019 and 2020 (the mover rate for U.S. residents age 1 and older was 11.0 percent in 2017; Moore, 2017), but a change in occupants could only be identified if a response was received in both time periods. Removing these cases would artificially decrease the self-response rate for both time periods.

post-hoc sample's base weights. Significance was tested for each research question based on a two-tailed t-test at the 10 percent significance level, unless otherwise stated. Comparisons between the 2019 Census Test sample in 2019 and the 2019 Census Test sample in 2020 were conducted using paired t-tests, while the comparisons between the 2019 Census Test sample in 2020 and the post-hoc sample were conducted using independent t-tests. These comparisons were conducted to determine if the differences were statistically different from zero.

MAFIDs that could not be matched to the 2020 Census were removed from the analysis. These units include, but are not limited to, those that were not valid for the final collection universe or the enumeration operations and cases that were determined to be transitory locations. The combined dataset has self-response data (i.e., self-response flag, mode of self-response, and date of self-response) for each address for both time periods.

The following section outlines the design of the study, including research questions and more in-depth methodology. Please note that the numbers appearing in this evaluation report have been subjected to the U.S. Census Bureau's approved disclosure avoidance techniques including noise injection and rounding.

3.1 Research Questions

1. For the sample of households included in the treatment condition of the 2019 Census Test (i.e., those that did not receive citizenship question), how did the self-response of these households compare between 2019 and 2020?

The 2019 Census Test started June 13, 2019, and ended August 15, 2019, which created a 64-day window to self-respond. Responses received during this time were included in the numerator. For the 2019 sample in the 2020 Census, the numerator included unduplicated, sufficient responses received from the start of the Internet Self-Response (ISR) operation on March 12, 2020, through May 14, 2020. Although the 2020 Census self-response period continued past May 14, 2020, this cutoff created a matching 64-day self-response window to match to the 2019 Census Test responses. Therefore, we compared self-response behavior in each 64-day timeframe for the households in the 2019 Census Test and the 2020 Census.

The original timeframe for this analysis was from the start of the ISR operation, March 12, 2020, through the NRFU universe creation on May 6, 2020. Because of the COVID-19 pandemic, the NRFU workload was created for the first area census office on June 23, 2020², creating a 103-day window from the start of online self-response on March 12, 2020. The overall SRR for the 103-day window was included in this research question's analysis for completeness but was removed from all subsequent analyses.

² For more information about the updated NRFU workload creation date or the phases NRFU data collection, see Beamer, 2021.

For all time periods, the denominator consisted of the sum of all base weights. Vacant self-responses were considered insufficient. Equation 1 shows the calculation for SRRs.

$$\text{Self-Response Rate} = \frac{\sum(\text{Sufficient Self-Response Flag} * \text{base weight})}{\sum(\text{base weight})} \quad (1)$$

The post-hoc sample's 2020 SRRs were calculated using Equation 1, and the 2020 SRRs from both samples were compared. The same 64-day timeframe, March 12, 2020, through May 14, 2020, from the 2019 sample in 2020 was used for the post-hoc sample. This determined if participating in the 2019 Census Test affected the likelihood of responding in 2020.

2. Were there changes in proportion of online self-response between 2019 and 2020?

SRRs by mode were calculated for both time periods. Again, we compared 2019 Census Test sample's 2020 SRRs to the post-hoc sample. In the 2019 Census Test, CQA was known as the Telephone Questionnaire Assistance (TQA). TQA cases are included in the CQA mode categories. Equation 2 shows the calculation for SRRs by mode.

$$\text{Self-Response Rate}_{\text{Mode}} = \frac{\sum(\text{Sufficient Self-Response Flag}_{\text{Mode}} * \text{base weight})}{\sum(\text{base weight})} \quad (2)$$

SRRs by mode were compared between the two time periods and between the 2019 Census Test sample's 2020 rates and the post-hoc sample.

Changes in Response Mode. Using the combined 2019 and 2020 data, we tabulated how 2019 Census Test sample households changed response modes between 2019 and 2020. Comparisons were made to determine if a significant percentage of households that did not respond in 2019 responded in 2020 by mode and whether respondents that used mail or CQA in 2019 switched to internet in 2020. This will indicate if there was a change in the proportion of online self-response between 2019 and 2020 because of the decennial environment.

3. Did the effect of the decennial environment differ between audience segments?

Audience segmentation data was used to subset the 2019 Census Test and 2020 Census data. Counts of responses, overall and by mode, were originally planned to be tabulated for both time periods for all eight audience segments and compared through a Rao-Scott chi-square test. Because the 2019 Census Test sample was used for both time periods, independence required for a chi-square test was violated. Therefore, SRRs overall, and separately for each response mode, by audience segmentation were compared using a series of paired t-tests. We used Equation 3 to calculate the SRRs, overall and by mode.

$$\text{Self-Response Rate}_{\text{Mode+Segment}} = \frac{\sum(\text{Sufficient Self-Response Flag}_{\text{Mode+Segment}} * \text{base weight})}{\sum(\text{base weight})} \quad (3)$$

4. How did the 2020 mailing cohorts' SRR and proportion of internet response compare to 2019?

The 2019 Census Test households were matched to the 2020 Census data where the contact strategy was the same to ensure that a difference in contact strategy did not influence the response pattern. If there was a difference in contact strategy, the case was not included in this analysis. The 2020 Census mailing cohorts were updated based on the Census Program for Evaluations and Experiments alternate mailings. The 2019 Census Test households were then grouped by their 2020 mailing cohort assignment. Similar to Question 3, self-response counts, by mode, were originally planned to be tabulated for each cohort and compared using a Rao-Scott chi-square test. The data violate the independence required for a Rao-Scott chi-square test. SRRs overall, and separately for each response mode, by mailing cohort were compared using a series of paired t-tests. SRRs were calculated using Equation 4.

$$Self - Response Rate_{Mode+Cohort} = \frac{\sum(\text{Sufficient Self-Response Flag}_{Mode+Cohort} * \text{base weight})}{\sum(\text{base weight})} \quad (4)$$

3.2 Schedule

See Table 1 for the schedule of this evaluation.

Table 1. Schedule of the Operational and Analysis Milestones for the Decennial Environment Study

Activity	Timing
2019 Census Test Data Collection	June 13, 2019 – August 15, 2019
Finalize the Study Plan for Comparing 2019 Census Test and 2020 Census SRRs to Estimate Decennial Environment	December 3, 2019
2020 Census Self-Response Data Collection	March 12, 2020 – October 15, 2020 ³
Examine Results and Conduct Analysis for Comparing 2019 Census Test and 2020 Census SRRs to Estimate Decennial Environment Report	October 8, 2021 – February 8, 2022
Prepare Initial Draft of Comparing 2019 Census Test and 2020 Census SRRs to Estimate Decennial Environment Report	February 9, 2022 – July 1, 2022

4. Limitations

The following limitations apply to the comparison of the 2019 Census Test and 2020 Census SRRs evaluation.

1. This evaluation could not distinguish between the contributions of different aspects of the 2020 Census communication campaign (e.g., national paid advertising, community partners, state-funded initiatives).

³ Dates from revised schedule at <<https://www.census.gov/programs-surveys/decennial-census/decade/2020/planning-management/operational-adjustments.html>>.

2. Paper questionnaires were mailed at different times for each mailing cohort, which may have affected the paper mode SRRs. Additionally, mailing delays may have affected the SRRs for paper.
3. Because our timeframe for the 2020 Census self-response was limited to March 12, 2020, through May 14, 2020, responses may have been received after this time. In this analysis, these households are categorized as having no self-response.
4. The 2019 Census Test was labeled as a test. Therefore, people may have been less inclined to respond.
5. This evaluation used addresses as the unit of analysis, and housing units may have changed occupants between the 2019 test and the 2020 Census.
6. The 2019 Census Test did not allow for non-ID response, which may have reduced SRRs.
7. Census Day for the 2019 Census Test was July 1, while Census Day in 2020 was April 1; the difference in season may influence how likely households were to respond.
8. Audience segment and mailing cohort assignments were based on predicted likelihood of self-response among other factors, and so comparisons between groups may be difficult to interpret.
9. There was less support for non-English languages during the 2019 Census Test than there was for the 2020 Census, e.g., the 2020 Census internet instrument was available in 13 languages, but the 2019 Census Test was only available in English and Spanish (Poehler, Barth, & Oliver, 2019). The wider availability of non-English materials may have contributed to the increase in internet self-response in 2020 relative to 2019.
10. Not all households in the 2019 Census Test and the post-hoc sample were included in the 2020 Census housing unit data. Approximately 2 percent of the households in the 2019 Census Test and 2 percent of the households in the post-hoc sample were removed because they were not in the 2020 Census enumeration universe. Addresses that were not included in the 2020 Census include, but are not limited to, those that were not valid for the final collection universe or for the enumeration operations.
11. COVID-19 may have influenced when and how households responded to the 2020 Census, as well as how people were able to interact with the decennial environment. More households may have responded online to reduce person to person contact. COVID-19 also affected the processing times at the National Processing Center for paper questionnaires.
12. The citizenship question was not asked in the 2019 Census Test treatment group that was included in our analysis. However, the decision for whether to add the citizenship question to the 2020 Census was still being debated and covered in the media. This may have impacted the SRRs.

5. Results

There were 240,000 households in the 2019 Census Test that were assigned to the treatment condition. These households matched to 235,000 households in the 2020 Census. The post-hoc sample contained 240,000 households, which matched to 235,000 households in the 2020 Census. The following questions were established to evaluate of the decennial environment.

1. For the sample of households included in the treatment condition of the 2019 Census Test (i.e., those that did not receive citizenship question), how did the self-response of these households compare between 2019 and 2020?

The 2019 Census Test SRR was calculated out of the 235,000 households matching the 2020 Census. Table 2 below shows the SRRs for each sample and timeframe. The 2019 Census Test sample in 2020 during the entire self-response timeframe of March 12 to June 23, 2020, is included for completeness. The overall difference in SRRs between the 2019 Census Test and the 2020 Census of 8.3 percentage points was statistically significant (p -value < 0.0001). Therefore, we have evidence that the 2020 self-response displayed different response patterns than the 2019 Census Test.

Similarly, the overall difference in SRRs between the 2019 sample in 2020 and the 2020 post-hoc sample of 2.9 percentage points was statistically significant (p -value < 0.0001). Therefore, we have evidence that the households in the 2019 sample in 2020 displayed different response patterns than the 2020 post-hoc sample. Results from the statistical testing are shown in Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and 2020 Census Post-Hoc File. Standard errors are in parenthesis.

Table 3.

Table 2. SRRs for 2019 Census Test Sample at Each Time Point and Post-Hoc Sample's SRR

Sample	SRR (%)
Post-Hoc Sample in 2020	62.9 (0.1)
2019 Census Test Sample in 2019	51.7 (0.2)
2019 Census Test Sample in 2020 (03/12/2020 – 05/14/2020)	60.0 (0.1)
2019 Census Test Sample in 2020 (03/12/2020 – 06/23/2020)	62.5 (0.1)

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and 2020 Census Post-Hoc File. Standard errors are in parenthesis.

Table 3. Comparison of SRRs Through Paired and Independent T-tests

Sample Comparison	Difference (%)	P-Value
Comparing 2019 Census Test Sample in 2020 (03/12/2020 – 05/14/2020) to Post-Hoc Sample in 2020	-2.9 (0.2)	<0.0001
Comparing 2019 Census Test Sample in 2019 to 2019 Census Test Sample in 2020 (03/12/2020 – 05/14/2020)	-8.3 (0.1)	<0.0001

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and 2020 Census Post-Hoc File. Standard errors are in parenthesis.

2. Were there changes in proportion of online self-response between 2019 and 2020?

Table 4 shows the distribution of SRRs for each mode. In addition to households that did not self-respond, the no self-response category includes responses that were insufficient or outside the timeframe.

There was enough evidence to conclude that the 34.8 SRR through the internet mode in the 2019 Census Test was statistically significantly different from the 48.8 SRR through the internet mode in the 2019 sample in 2020 Census (p -value < 0.0001). The post-hoc sample had the highest rate of internet self-response at 51.6 percent, which was statistically significantly different from the internet SRR from the 2019 Census Test sample in 2020 (p -value < 0.0001).

While there was a statistically significant difference in the overall SRR between the 2019 sample in 2020 and the post-hoc sample, there was no significant difference in the mail mode between these two samples (p -value = 0.3274). The 2019 mail SRR was greater than the 2020 mail SRR. This was the only result that was not significant in all samples.

Table 4. SRRs by Mode for 2019 Census Test and 2020 Census

	Mail SRR (%)	Internet SRR (%)	CQA SRR (%)	No SR (%)
Post-Hoc Sample in 2020	10.5 (0.1)	51.6 (0.1)	0.8 (<0.1)	37.1 (0.1)
2019 Census Test Sample in 2019	15.9 (0.1)	34.8 (0.1)	0.9 (<0.1)	48.3 (0.2)
2019 Census Test Sample in 2020	10.4 (0.1)	48.8 (0.1)	0.7 (<0.1)	40.0 (0.1)

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and 2020 Census Post-Hoc File

Rows may not sum to 100 percent because of rounding. Standard errors are in parentheses.

Table 5. Comparison of SRRs by Mode for 2019 Census Test and 2020 Census Through T-tests

Sample Comparison	Mode	Difference (%)	P-Value
Comparing 2019 Census Test Sample in 2019 to 2019 Census Test Sample in 2020	Mail	5.5 (0.1)	<0.0001
Comparing 2019 Census Test Sample in 2019 to 2019 Census Test Sample in 2020	Internet	-14.0 (0.1)	<0.0001
Comparing 2019 Census Test Sample in 2019 to 2019 Census Test Sample in 2020	CQA	0.2 (<0.1)	<0.0001
Comparing 2019 Census Test Sample in 2019 to 2019 Census Test Sample in 2020	No Self-Response	8.3 (0.1)	<0.0001
Comparing 2019 Census Test Sample in 2020 to Post-Hoc Sample in 2020	Mail	-0.1 (0.1)	0.3274
Comparing 2019 Census Test Sample in 2020 to Post-Hoc Sample in 2020	Internet	-2.8 (0.2)	<0.0001
Comparing 2019 Census Test Sample in 2020 to Post-Hoc Sample in 2020	CQA	-0.1 (<0.1)	0.0009
Comparing 2019 Census Test Sample in 2020 to Post-Hoc Sample in 2020	No Self-Response	2.9 (0.2)	<0.0001

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and 2020 Census Post-Hoc File

Standard errors are in parentheses.

The changes in response mode for self-response for 2019 Census Test households are shown in Table 6 below. The percentages are out of the weighted number of households in 2019 and 2020. The off-diagonal cells describe the rates at which households changed response behavior between 2019 and 2020.

A significant percentage of households changed from mail or CQA to an internet response between 2019 and 2020 (p-value < 0.0001). Additionally, a significant percentage of households who did not self-respond in 2019 self-responded in 2020, each mode with a p-value < 0.0001. About a third (30.3 percent) of the households did not respond in 2019 and 2020. Significance was tested based on a two-tailed paired t-test, shown in

Table 7, to determine if the difference was statistically different from zero. The 10 percent significance level was adjusted to a 2 percent significance level based on the Bonferroni correction.

Table 6. Change in Mode of Self-Response for 2019 Census Test Sample Households

	% Self-Response by Mail in 2020	% Self-Response by Internet in 2020	% Self-Response by CQA in 2020	% No Self- Response in 2020
% Self-Response by Mail in 2019	6.2 (0.1)	5.9 (0.1)	0.2 (<0.1)	3.6 (<0.1)
% Self-Response by Internet in 2019	1.2 (<0.1)	27.7 (0.1)	0.1 (<0.1)	5.8 (0.1)
% Self-Response by CQA in 2019	0.2 (<0.1)	0.3 (<0.1)	0.2 (<0.1)	0.2 (<0.1)
% No Self-Response in 2019	2.9 (<0.1)	14.8 (0.1)	0.3 (<0.1)	30.3 (0.1)

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1

Cells may not sum to 100 percent because of rounding. Standard errors are in parentheses.

Table 7. Comparison of Mode of Self-Response for 2019 Census Test Sample Households Through T-test

Mode in 2019 Census Test	Mode in 2020 Census	SRR (%)	P-Value
Mail	Internet	5.9 (0.1)	<0.0001
CQA	Internet	0.3 (<0.1)	<0.0001
No Self-Response	Mail	2.9 (<0.1)	<0.0001
No Self-Response	CQA	0.3 (<0.1)	<0.0001
No Self-Response	Internet	14.8 (0.1)	<0.0001

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1

Standard errors are in parentheses.

3. Did the effect of the decennial environment differ between audience segments?

Table 8 below compares the self-response rates for the 2019 Census Test to the 2020 Census by mode and audience segment. The overall SRRs within each audience segment between the 2019 Census Test and the 2020 Census were significantly different. The highest SRR was within the responsive suburbia segment for both time periods.

CQA in the “No American Community Survey (ACS) Mailout” segment was the only mode to not significantly differ within segment from 2019 to 2020 (p-value = 0.1310). This segment consists of tracts that had no mailable addresses in the ACS. All other modes, including internet, were significantly different within each audience segment from 2019 to 2020. Significance was tested based on a 10 percent significance level, shown in Table 9.

Table 8. SRRs by Mode and Audience Segment

1 – Responsive Suburbia				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	11.7 (0.1)	50.9 (0.3)	0.9 (0.1)	63.5 (0.3)
2019 Census Test Sample in 2020	5.1 (0.1)	64.9 (0.3)	0.6 (<0.1)	70.5 (0.3)
2 – Main Street Middle				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	18.5 (0.2)	37.3 (0.2)	1.2 (0.1)	57.1 (0.3)
2019 Census Test Sample in 2020	11.3 (0.1)	51.2 (0.3)	1.0 (<0.1)	63.6 (0.2)
3 – County Roads				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	22.8 (0.3)	29.5 (0.3)	0.9 (0.1)	53.2 (0.3)
2019 Census Test Sample in 2020	16.5 (0.3)	42.2 (0.3)	0.6 (<0.1)	59.3 (0.3)
4 – Downtown Dynamic				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	8.5 (0.2)	38.1 (0.3)	0.8 (<0.1)	47.3 (0.3)
2019 Census Test Sample in 2020	4.8 (0.1)	49.8 (0.3)	0.6 (<0.1)	55.3 (0.3)
5 – Student and Military Communities				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	7.2 (0.4)	31.3 (0.8)	0.8 (0.1)	39.2 (0.9)
2019 Census Test Sample in 2020	4.0 (0.3)	44.8 (0.8)	0.5 (0.1)	49.3 (0.7)
6 – Sparse Spaces				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	19.9 (0.4)	24.0 (0.4)	0.9 (0.1)	44.8 (0.5)
2019 Census Test Sample in 2020	15.4 (0.4)	34.1 (0.5)	0.5 (0.1)	50.1 (0.6)
7 – Multicultural Mosaic				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	15.2 (0.2)	21.7 (0.2)	0.7 (<0.1)	37.5 (0.2)
2019 Census Test Sample in 2020	11.5 (0.2)	39.4 (0.2)	0.9 (0.1)	51.8 (0.2)
8 – Rural Delta and Urban Enclaves				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	18.7 (0.3)	12.0 (0.3)	0.6 (0.1)	31.3 (0.4)
2019 Census Test Sample in 2020	15.9 (0.3)	30.8 (0.4)	0.9 (0.1)	47.6 (0.5)
NA – No ACS Mailout				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	10.7 (1.1)	22.2 (1.5)	1.0 (0.4)	33.9 (1.6)
2019 Census Test Sample in 2020	8.5 (1.1)	28.4 (1.5)	0.4 (0.2)	37.3 (1.4)

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1
Standard errors are in parentheses.

Table 9. Comparing SRRs by Mode and Audience Segment Through Paired T-tests

1 – Responsive Suburbia				
	Mail	Internet	CQA	Overall
Difference	6.5 (0.2)	-14.0 (0.3)	0.4 (0.1)	-7.1 (0.3)
P-Value	<0.0001	<0.0001	<0.0001	<0.0001
2 – Main Street Middle				
	Mail	Internet	CQA	Overall
Difference	7.1 (0.2)	-13.9 (0.2)	0.3 (0.1)	-6.5 (0.3)
P-Value	<0.0001	<0.0001	0.0001	<0.0001
3 – County Roads				
	Mail	Internet	CQA	Overall
Difference	6.3 (0.3)	-12.7 (0.3)	0.3 (0.1)	-6.1 (0.3)
P-Value	<0.0001	<0.0001	<0.0001	<0.0001
4 – Downtown Dynamic				
	Mail	Internet	CQA	Overall
Difference	3.6 (0.2)	-11.7 (0.3)	0.1 (0.1)	-8.0 (0.3)
P-Value	<0.0001	<0.0001	0.0509	<0.0001
5 – Student and Military Communities				
	Mail	Internet	CQA	Overall
Difference	3.2 (0.4)	-13.5 (0.9)	0.3 (0.1)	-10.1 (0.9)
P-Value	<0.0001	<0.0001	0.0532	<0.0001
6 – Sparse Spaces				
	Mail	Internet	CQA	Overall
Difference	4.5 (0.4)	-10.1 (0.4)	0.4 (0.1)	-5.2 (0.5)
P-Value	<0.0001	<0.0001	0.0014	<0.0001
7 – Multicultural Mosaic				
	Mail	Internet	CQA	Overall
Difference	3.7 (0.2)	-17.7 (0.2)	-0.3 (0.1)	-14.3 (0.3)
P-Value	<0.0001	<0.0001	<0.0001	<0.0001
8 – Rural Delta and Urban Enclaves				
	Mail	Internet	CQA	Overall
Difference	2.8 (0.3)	-18.8 (0.3)	-0.4 (0.1)	-16.3 (0.4)
P-Value	<0.0001	<0.0001	0.0002	<0.0001
NA – No ACS Mailout				
	Mail	Internet	CQA	Overall
Difference	2.3 (1.2)	-6.3 (1.6)	0.6 (0.4)	-3.4 (1.7)
P-Value	0.0679	0.0001	0.1310	0.0523

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1
Standard errors are in parentheses.

4. How did 2020 mailing cohorts' SRR and proportion of internet response compare to 2019?

Table 10 shows the self-response rates by mode and mailing cohort. There were 234,000 unweighted households with the same contact strategy in 2019 and 2020. The highest SRRs overall were in the Internet First Cohort 3 for both samples. All overall differences in responses within each mailing cohort between 2019 and 2020 were statistically different. Therefore, there was sufficient evidence that the decennial environment affected the overall SRR for the mailing cohorts, each with p-values < 0.0001.

By mode, CQA self-response rates in Internet Choice and Internet First Cohort 2 were not statistically different between 2019 and 2020 (p-values = 0.2780 and 0.2338 respectively). All other differences by mode within each mailing cohort between 2019 and 2020 were significant. Therefore, the response pattern changed significantly for internet response in each mailing cohort between 2019 and 2020, which may have been caused by decennial environment. Details about the significance testing are in Table 11.

Table 10. SRRs by Mode and Mailing Cohort

Internet Choice				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	29.5 (0.3)	10.6 (0.2)	0.4 (<0.1)	40.6 (0.3)
2019 Census Test Sample in 2020	26.6 (0.3)	22.7 (0.2)	0.5 (<0.1)	49.8 (0.3)
Internet First Cohort 1				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	11.5 (0.2)	37.8 (0.2)	0.9 (<0.1)	50.3 (0.2)
2019 Census Test Sample in 2020	7.0 (0.1)	51.8 (0.2)	0.7 (<0.1)	59.5 (0.2)
Internet First Cohort 2				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	12.1 (0.2)	37.2 (0.2)	1.1 (<0.1)	50.4 (0.3)
2019 Census Test Sample in 2020	6.3 (0.1)	52.6 (0.3)	1.0 (<0.1)	60.0 (0.2)
Internet First Cohort 3				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	13.3 (0.2)	51.2 (0.3)	1.2 (0.1)	65.7 (0.2)
2019 Census Test Sample in 2020	5.6 (0.1)	64.7 (0.2)	0.7 (<0.1)	71.1 (0.2)
Internet First Cohort 4				
	Mail (%)	Internet (%)	CQA (%)	Overall (%)
2019 Census Test Sample in 2019	12.5 (0.2)	37.6 (0.3)	1.0 (0.1)	51.1 (0.3)
2019 Census Test Sample in 2020	5.3 (0.2)	53.0 (0.3)	0.8 (<0.1)	59.1 (0.3)

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and T1_SDF.
Standard errors are in parentheses.

Table 11. Comparing SRRs by Mode and Mailing Cohort

Internet Choice				
	Mail	Internet	CQA	Overall
Difference	2.9 (0.2)	-12.1 (0.2)	<0.1 (<0.1)	-9.2 (0.3)
P-Value	<0.0001	<0.0001	0.2780	<0.0001
Internet First Cohort 1				
	Mail	Internet	CQA	Overall
Difference	4.5 (0.2)	-14.0 (0.2)	0.2 (0.1)	-9.2 (0.2)
P-Value	<0.0001	<0.0001	<0.0001	<0.0001
Internet First Cohort 2				
	Mail	Internet	CQA	Overall
Difference	5.8 (0.2)	-15.4 (0.3)	0.1 (0.1)	-9.5 (0.3)
P-Value	<0.0001	<0.0001	0.2338	<0.0001
Internet First Cohort 3				
	Mail	Internet	CQA	Overall
Difference	7.7 (0.2)	-13.5 (0.3)	0.4 (0.1)	-5.4 (0.3)
P-Value	<0.0001	<0.0001	<0.0001	<0.0001
Internet First Cohort 4				
	Mail	Internet	CQA	Overall
Difference	7.2 (0.2)	-15.4 (0.3)	0.2 (0.1)	-8.0 (0.3)
P-Value	<0.0001	<0.0001	0.0144	<0.0001

Source: U.S. Census Bureau, 2019 Census Test, 2020 Census Decennial Response File 1, and T1_SDF.
Standard errors are in parentheses.

6. Conclusions and Recommendations

The following conclusions and recommendations were derived from the analysis conducted on the research questions in this report.

6.1 Conclusions

The overall SRR of 51.7 percent for the households in the 2019 Census Test and 60.0 percent for those households in the 2020 Census for the 64-day self-response timeframe were significantly different by an average of 8.3 percentage points. The post-hoc sample overall SRR of 62.9 percent was significantly different by an average of 2.9 percentage points compared to the 2019 sample in 2020. Confusion over the multiple tests may have caused the difference. We infer that households are more likely to respond after being exposed to the decennial environment of the 2020 Census.

The decennial environment also changed how people responded. There was a significant difference of 14.0 percentage points in the internet self-response mode for households in both

the 2019 Census Test and the 2020 Census. Therefore, we have sufficient evidence to conclude that the decennial environment encouraged more people to respond through the internet.

There was significant evidence that the overall SRR in each of the audience segments were different between 2019 and 2020. There was a significant difference in the proportion of internet response in 2020 compared to 2019 for each audience segment, indicating that the decennial environment encouraged people to respond online.

There was a significant difference in the overall SRRs between the 2019 Census test and 2020 Census in all mailing cohorts. Because the 2019 Census Test and 2020 Census used the same contact strategies, the difference in Internet First mailing cohort overall SRRs may have been caused by the decennial environment, which encourages people to respond online. There was a significant difference in proportion of internet response in 2020 compared to 2019 for each mailing cohort, indicating that the decennial environment encouraged people to respond online.

6.2 Recommendations

The following recommendations were derived from the conclusions from the decennial environment.

1. The goal of the advertising campaigns of the 2020 Census was to encourage households to self-respond, specifically through the internet response mode. Research has shown that outreach strategies encouraged self-response, specifically online self-response, to the decennial census. The 2030 Census design should continue these strategies used to promote online self-response in the 2020 Census.
2. The post-hoc sample's SRR of 62.9 was significantly higher than the 2019 Census Test SRR of 60.0. Do not conduct a test for at least a year before the 2030 Census to reduce respondent burden and confusion between tests and the actual census.

7. Review/Approval Table

The individuals or groups that appear in the table below have reviewed and approved this operational assessment report.

Role	Approval Date
Decennial Census Management Division (DCMD) ADC for Nonresponse, Evaluations, and Experiments	07/25/2022
Decennial Research Objectives and Methods (DROM) Working Group	07/25/2022
Decennial Communications Coordination Office (DCCO)	01/20/2023

8. Document Revision and Version Control History

The table below includes entries for each major version of this operational assessment report along with a brief description of the version and/or any changes made to the preceding version.

Version/Editor	Date	Version Description/Revisions
1.0/Bernstein	1/20/2023	Final Version Approved for Public

9. References

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Appendix: Glossary of Acronyms and Abbreviations

Acronym	Definition
ACS	American Community Survey
CQA	Census Questionnaire Assistance
DRF	Decennial Response File
DROM	Decennial Research Objectives and Methods
DSSD	Decennial Statistical Studies Division
MAFID	Master Address File Identifier
NRFU	Nonresponse Followup
SDF	Sample Delivery File
SRR	Self-Response Rate
TQA	Telephone Questionnaire Assistance